## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

## SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION GRADATION ROCK DESCRIPTION TERMS AND DEFINITIONS HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSI UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT FOWER AUGER, AND WHICH YELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586), SOIL ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. CORET GRADED. SAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. AGUIFER - A WATER BEARING FORMATION OR STRATA. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS CENERALLY SHALL INCLUDE ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASSITO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, RGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS R HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. WEATHERED PER FOOT. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT CRYSTALLINE ROCK (CR) WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE TH MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. VOLUD YIELD SYT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,
ONEISS, GABBRO, SCHIST, ETC.
FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SILT-CLAY MATERIALS GROUND SURFACE. ORGANIC MATERIALS CLASS. ( 45% PASSING #200) SET PASSING #200 CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COMPRESSIBILITY A-1 A-3 A-4 A-5 A-6 A-7 A-1. A-2 A-4, A-5 GROUP NON-CRYSTALLINE SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED, ROCK TYPE COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM BUCK (NCB) CLASS. A-3 A-6, A-7 A-2-4 A-2-5 A-2-6 A-2-7 -1-a A-1-b LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 SLIGHTLY COMPRESSIBLE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE SYMBOL <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED PERCENTAGE OF MATERIAL PASSING SILT-WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT SILT- CLAY CLAY ORGANIC MATERIAL OTHER MATERIAL OCKS OR CUTS MASSIVE ROCK. SOILS PEAT SOTUS SOTI S SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER \* 200 5 MX 25 MX 10 M ACE OF ORGANIC MATTER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 3 - 5% TRACE 1 - 10% HAMMER IF CRYSTALLINE. LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE INRIZONTAL . 1 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN TOUR LIMIT INDERATELY ORGANIC VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, 20 - 35% N-P - 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF LASTIC INDEX (V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF LITTLE OR IGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE HE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. MODERATE OF A CRYSTALLINE NATURE. GROUP INDEX 4 MX 8 MX 12 MX 16 MX No MX Ø 0 GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP SOILS USUAL TYPES STONE FRAGS  $\nabla$ IDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. GRAVEL AND SAND SILTY OR CLAYEY ORGANIC WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. (SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR GRAVEL AND SAND SOILS SOILS CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. ATERIALS SAND STATIC WATER LEVEL AFTER 24 HOURS MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GEN. RATING FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. VPW. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS EXCELLENT TO GOOD POOR AS A FAIR TO POOR DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED SUBGRAD OW-WITH ERESH ROCK. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY SPRING OR SEEPAGE P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH MODERATELY CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN (MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. COMPACTNESS OR PRIMARY SOIL TYPE ROADWAY EMBANKMENT ENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/FT2 ) DPT DMT TEST BORING SAMPLE IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. (N-VALUE) WITH SOIL DESCRIPTION DESIGNATIONS SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED VERY LOOSE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME SOUL SYMBO AUGER BORING S- BULK SAMPLE 4 TO 10 EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. MEDIUM DENSE 10 TO 30 30 TO 50 ARTIFICIAL FILL OTHER THAN LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS MATERIAL SS- SPLIT SPOON IF TESTED, YIELDS SPT N VALUES > 100 BPF CORE BORING (NON-COHESIVE) ROADWAY EMBANKMENTS MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT VERY DENSE >50 OILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS WITH ONLY FRAGMENTS OF STRONG ROCK INFERRED SOIL BOUNDARIES VERY SOFT **\***\*O SAMPLE PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN (0.25 REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SLICH THAT ONLY MINOR MONITORING WELL GENERALLY 2 TO 4 0.25 TO 0.5 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF TERVENING IMPERVIOUS STRATUM. INFERRED ROCK LINE RS- ROCK SAMPLE MEDIUM STIFE STI T-CLAY 4 TO 8 PIEZOMETER Ø.5 TO 1 ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND Δ COMPLETE RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. INSTALLATION MATERIAL 1 TO 2 RT- RECOMPACTED ALLUVIAL SOIL BOUNDARY VERY STIFF ROCK QUALITY DESIGNATION (R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AN (COHESIVE) 15 TO 30 SLOPE INDICATOR INSTALLATION TRIAXIAL SAMPLE  $\bigcirc$ DIP/DIP DIRECTION OF ROCK STRUCTURES CBR - CBR SAMPLE ROCK HARDNESS EXPRESSED AS A PERCENTAGE. TEXTURE OR GRAIN SIZE - SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SOLINDING ROD REF- SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053 <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL **ABBREVIATIONS** CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED HARD COARSE FINE BOLL DEB CORRUE GRAVEL SILT TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS PMT - PRESSUREMETER TEST MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (SL.) (CL.) BT - BORING TERMINATED SD - SAND SANDY SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY 2.0 0.25 0.05 0.005 305 BY MODERATE BLOWS. CPT - CONE PENETRATION TEST SIZE IN. 12" SLI. - SLIGHTLY STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 (NCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH CSE. - COARSE MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFF OR PICK POINT. TCR - TRICONE REFUSAL SOIL MOISTURE - CORRELATION OF TERMS DMT - DILATOMETER TEST CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE  $\gamma$  - UNIT WEIGHT A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE POINT OF A GEOLOGISTS PICK. FIELD MOISTURE 7d - DRY UNIT WEIGHT GUIDE FOR FIELD MOISTURE DESCRIPTION CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS e - VOID RATIO SOFT W - MOISTURE CONTENT STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN FOSS. - FOSSILIFEROUS V. - VERY PIECES CAN BE BROKEN BY FINGER PRESSURE. - SATURATED USUALLY LIQUID; VERY WET, USUALLY FRAC. - FRACTURED VST - VANE SHEAR TEST TRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FROM BELOW THE GROUND WATER TABLE (SAT.) CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH FRAGS. - FRAGMENTS LIQUID LIMIT OTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED Y THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY MED. - MEDITIM SEMISOLID: REQUIRES DRYING TO RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BEDDING PLASTIC LIMIT TERM THICKNESS HAMMER TYPE BL-102 REBAR AND CAP SET 6" BELOW SURFACE SPACING DRILL UNITS ADVANCING TOOLS: BENCH MARK: VERY THICKLY BEDDED > 4 FEET VERY WIDE 24.44 FEET LEFT OF -L- STA. 15+93.79 MORE THAN 10 FEET SOLID; AT OR NEAR OPTIMUM MOISTURE OPTIMUM MOISTURE - MOIST - (M) AUTOMATIC MANUAL THICKLY BEDDED 1.5 - 4 FEET CLAY BITS 3 TO 10 FEET MOBILE B-47 SHRINKAGE LIMIT 0.16 - 1.5 FEET **ELEVATION: 9.41 FEET** THINLY BEDDED MODERATELY CLOSE 1 TO 3 FEET 6° CONTINUOUS FLIGHT AUGER VERY THINLY BEDDED 0.03 - 0.16 FEFT REQUIRES ADDITIONAL WATER TO CORE SIZE: CLOSE 0.16 TO 1 FFF1 - DRY - (D) NOTES: BK-51 THICKLY LAMINATED ATTAIN OPTIMUM MOISTURE VERY CLOSE LESS THAN 0.16 FEET 8° HOLLOW AUGERS THINLY LAMINATED < 0.008 FEET PLASTICITY INDURATION CME-45B HARD FACED FINGER BITS -NWD-4 FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI DRY STRENGTH TUNG.-CARBIDE INSERTS NONPLASTIC \_\_\_ CME-550 \_\_\_H\_\_ 0-5 VERY LOW RUBBING WITH FINGER FREES NUMEROUS GRAI FRIABLE CASING W/ ADVANCER LOW PLASTICITY 6-15 SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MED, PLASTICITY PORTABLE HOIST TRICONE 215/16 \* STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: POST HOLE DIGGER HIGH PLASTICITY 26 OR MORE HIGH MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER TRICONE COLOR HAND AUGER OTHER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; SOUNDING ROD CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY DIFFICULT TO BREAK WITH HAMMER. VANE SHEAR TEST OTHER MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. OTHER\_ SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: OTHER

STATE PROJECT NO. | SHEET NO. | TOTAL SHEETS

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